**Issues to comply with EU legislation on soil protection**

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**List of Acronyms**

|  |  |
| --- | --- |
| EC | European Commission |
| IED | Industrial Emissions Directive 2010/75/EU |
| IMPEL | European Union network for the implementation and enforcement of environmental law |
| IPPC | Integrated Pollution Prevention and Control |
| IPPC A/B permit | A/B integrated environmental permit (as defined in Law on Environment) |
| MoEPP | Ministry for Environment and Physical Planning |
| SEI | State Environmental Inspectorate |
| TA | Technical Assistance |

Table of Contents

[1. Introduction 4](#_Toc441674604)

[2. Necessary elements in EU-compliant soil policy 6](#_Toc441674605)

[2.1 Legislation and technical guides 6](#_Toc441674606)

[2.1.1. Preliminary considerations 6](#_Toc441674607)

[2.1.2. Comments to the draft Law on Soil Protection 7](#_Toc441674608)

[2.1.3. Comments to the draft Rulebook on the procedures and criteria for the identification and management of contaminated sites 7](#_Toc441674609)

[2.2 Capacity building and communication 8](#_Toc441674610)

[2.3 Financial issues 9](#_Toc441674611)

[2.4 Stakeholders involvement 10](#_Toc441674612)

[3. Soil pollution prevention 11](#_Toc441674613)

[3.1 Potentially soil polluting activities 11](#_Toc441674614)

[3.2 Soil baseline report 11](#_Toc441674615)

[3.2.1 IPPC (IED) sites 11](#_Toc441674616)

[3.2.2 Other sites (non IED) 12](#_Toc441674617)

[4. Soil investigation, risk assessment and remediation 14](#_Toc441674618)

[4.1 Introduction 14](#_Toc441674619)

[4.2 Soil investigation 14](#_Toc441674620)

[4.3 Risk assessment 15](#_Toc441674621)

[4.4 Soil remediation 15](#_Toc441674622)

[5 Managing historically contaminated sites (hotspots) 17](#_Toc441674623)

[5.1 Background information on Macedonia 17](#_Toc441674628)

[5.2 Identify the historical sites 18](#_Toc441674629)

[5.3 Risk and impact assessment and prioritization 19](#_Toc441674630)

[5.4 Action Plan 20](#_Toc441674631)

[5.5 Soils contaminated with lindane and its isomers 21](#_Toc441674632)

[6. Closing remarks 26](#_Toc441674633)

[Annex 1 Additional literature 28](#_Toc441674634)

[Annex 2 – Conceptual site model pictogram 29](#_Toc441674635)

# Introduction

Soil has a strategical value not only from the environmental point of view but also from the socioeconomical one for a state, **since** it contributes in a very important way to the activities that can be done (agriculture, residential, industrial, natural areas,…) and to the quality of life of the population. Therefore there is no doubt a **soil protection policy is needed. It was already said in the past:**

**The nation that destroys its soil destroys itself.**

**Franklin D. Roosevelt**

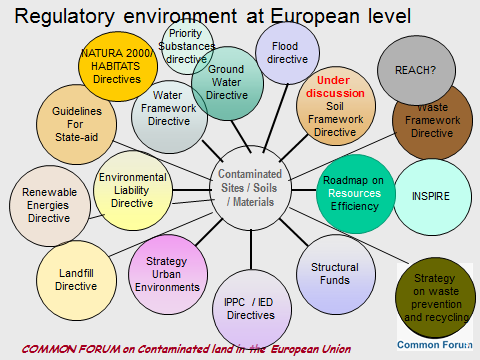
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Figure 1. Overview of EU-legislation with implications in soil policy and protection.

The **aim** of this document is **to raise some issues which are key to comply with the EU legislation on soil protection in Macedonia.** Figure 1 gives an overview of the current EU legislation and strategies where soil is part off. It is not possible to discuss all these Directives. The most relevant Directives are: the Environment Liability Directive, Waste Framework Directive, Water Framework Directive, Groundwater Directive and the Industrial Emissions Directive. In the 7th Environmental Action Plan of the EU it is stated that a risk-based approach will be laid down in a legal binding instrument. Therefore the European Commission has started Expert meetings how to work this out.

An important policy element is the need and task of a government to provide their inhabitants reliable information about risks of contamination and to inform them about the approach and results of remediation techniques. Being aware of the context of the present document, the intention is to outmark some relevant issues that we consider that should be taken into consideration more than a comprehensive analysis. The basis to select the issues have been the meetings with staff from the SEI and MoEPP and the information provided about the situation in the Republic of Macedonia.

When dealing with most soil issues there is no standard approach/solution. Different approaches have to be tailor-made to the country and organizations, and therefore, in the document, the key issues in soil policy will be raised and some information on the approach to them by different Member States, mainly The Netherlands and Basque Country (Spain), will be provided, but keeping always in mind the need of tailoring to the Macedonian situation. In order to be more operative links to relevant documents on the internet or annexes with information that is considered useful for taking further steps in the development of soil policy and legislation in the country will be provided.

In general the soil policy should be focussed on protection and keeping clean areas clean. That means that we have to deal with the legacy of contaminated land from the past. The trend in **soil policy** in Member States is to consider the multifunctional principle, with the objective of allowing every kind of reuse after remedation. This is not a principle that is practical for all situations. Normally, the countries set a date to start with this new policy and differentiate between:

1. Historically contaminated sites
2. Soil contamination events after setting the soil policy.

The main principle of soil policy is prevention of the contamination.

The information provided during meetings about the situation on Macedonia is that there is not a specific legislation on the subject but there is a draft Law on Soil Protection and a draft rulebook “on the procedures and criteria for the management of contaminated sites“ that are being discussed. Considering the present situation the document has as target group mainly the Ministry of Environment and Physical Planning, and has been structured in the following way. First, a chapter on *basic and critical elements* to be able to implement a soil protection policy that complies with standards of the European Union. Then, according to the above mentioned principles, there will be a chapter on *prevention*, another one on the *soil intervention after* a soil contamination risk or event after the new *legislation* is approved and finally a chapter on the historically contaminated soils or *hotspots*. In addition annexes are provided with information that is considered useful for taking further steps in the development of soil policy and legislation.

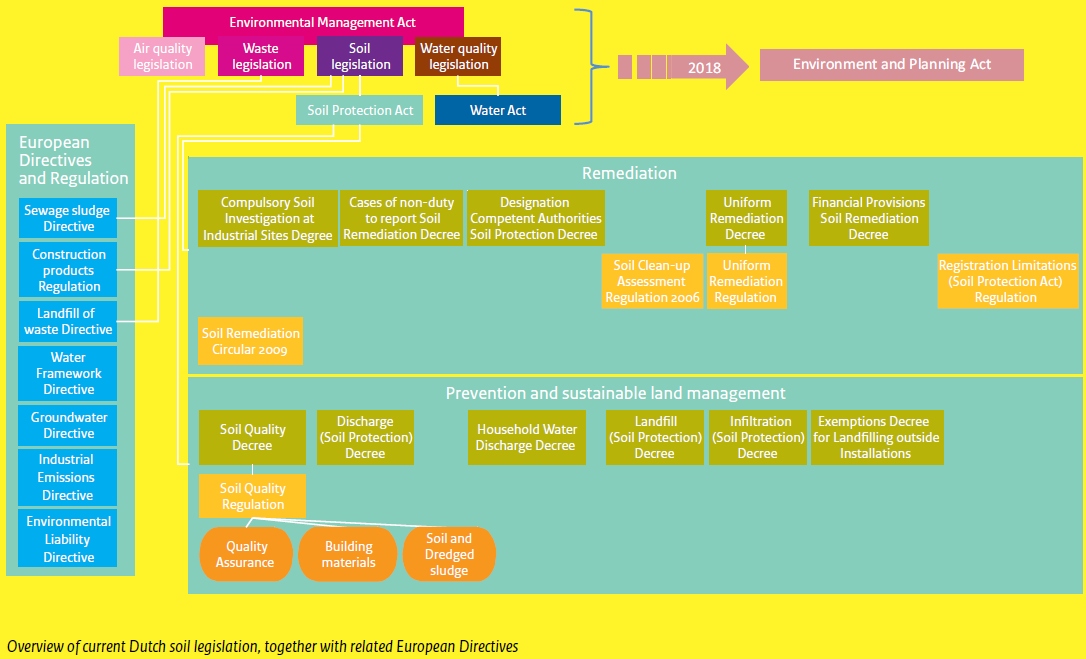
It must be finally emphasized that this document does not deal with diffuse contamination, and regarding contaminated sites it focus on the 16 hotspots (no further potential sites). Although groundwater is regulated on a separate Law, the effects of contamination of soil to groundwater are part of this analysis.

# Necessary elements in EU-compliant soil policy

## Legislation and technical guides

### 2.1.1. Preliminary considerations

When drafting the legislation, from the beginning, it has to be clear that soil legislation is not autonomous, is clearly connected to other general environmental legislation and related to legislation on other areas like waste, water, air,... Although it is good to start with sectorial laws in reality a system approach of the soil-sediment-water system is preferable and is becoming more common in the EU countries. E.g. The Netherlands are in a process of merging all sectorial Laws with the spatial planning into one Environmental and Planning Act. Figure 2 below provides an overview of current Dutch legislation, together with related European Directives.



When defining a soil policy it should include 3 main pillars: (i) prevention, (ii) management (dealing with excavated soils) and (iii) remediation of contaminated land (risk based).

At least the following EU environmental principles should be embedded in such legislation:

* ALARA ("as low as (is) reasonably achievable").
* Polluter pays principle.
* Duty of care.
* Precautionary principle.

### 2.1.2. Comments to the draft Law on Soil Protection

Currently the MoEPP is in the process of drafting a law on protection and remediation of soil. The draft law foresees the development of a series of secondary legislation and strategy documents (e.g. rules on the type and level of concentration of hazardous substances present in the soil, national plan for the remediation of contaminated sites). As a reference for the development of such legislation and strategies, it is recommended to read the following examples of useful national and regional soil policy documents, most of them available in English:

* The Netherlands:
  + Into Dutch Soils: <http://rwsenvironment.eu/subjects/soil/publications/> .  
     This document provides an overview of the headlines of the soil policy in The Netherlands.
  + Circular on soil remediation: <http://rwsenvironment.eu/subjects/soil/legislation-and/soil-remediation/>.
  + Netherlands Soil Protection Guideline for Industrial Activities: <http://rwsenvironment.eu/subjects/soil/legislation-and/soil-protection/> .
* Spain
  + Legislation in Spain

<http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/suelos-contaminados/09047122800b7aff_tcm7-3206.pdf>

* + Legislation in the Basque Country (in Spanish)

<http://www.jusap.ejgv.euskadi.eus/r47-bopvapps/es/bopv2/datos/2015/07/1502935a.pdf>

### 2.1.3. Comments to the draft Rulebook on the procedures and criteria for the identification and management of contaminated sites

In general the rulebook gives a good impression about procedures of investigation, risk assessment and remediation. What seems to be missing is the use of a standard risk model like Rebecca (from USEPA) or CSOIL (from NL). It is recommended that the national government should be the one to provide consultancies with such a model. Defining the risks of a site must be done objectively without leaving room for discussion or uncertainties for the polluter or owner of a site.

The rulebook says nothing about the qualifications of the people who work in the field and takes the samples, etc. It is recommended to specify that these activities can only done by certified persons (controlled by certified bodies), and that laboratories should be accreditated as well.

The rulebook seems to be not clear about the relationship to the technical documents. For example, what kind of substances must be investigated. If one does not look at certain substances one does not know if there is a contamination. E.g. in the Netherlands there is a standard list of parameters to be investigated:

* Organic matter
* Clay content
* Heavy metals: Ba, Cd, Co, Cu, Hg, Pb, Mb, Ni, Zn.
* Organic compounds: sum PCBs [[1]](#footnote-2), sum PACs [[2]](#footnote-3) and mineral oil.

Additional substances must be investigated if there is a suspicion link with other substances connected to the history of the site or the production process.

It was not seen a operational definition of a contamination in terms of volume of soil. E.g. in The Netherlands soil is defined as contaminated if 10 m3 exceed the intervention values or alternatively 25 m3 of groundwater.

It is recommendad that as part of the prescriptions in the technical documents there is the obligation of a conceptual site model (see Annex 2 for a pictogram). It is preferable to make protocols (on a operational level) for the preliminary and main investigations.

In the Annex 1 of the rulebook 93 potentially pollutant activies are defined. This is considered a good way to get insight of the workload related to contaminated sites in the Republic of Macedonia.

The different steps in the procedure for the management of polluted sites needs also formal decisions of the competent authority. In the rulesbook it states that the competent authority has to react, but is there also an approval required?

The main driver for solving the legacy of contaminated sites is the way the liability is formulated in the Law. It should be clear that for “new” contamination the polluter-pays-principle is valid. For historical contamination this also should be the starting point, but that is not always possible because often they cannot be found anymore or have died. Therefore in The Netherlands the owner of the site is liable for the contamination and thereby for the costs of the remediation. If the owner (or leaser) is not the polluter (and the polluter can be found) he has to go to private court to claim the costs and other damages. Therefore it is reasonable if the polluter cannot be found anymore that the owner (or leaser) receives a subsidy from the government as a contribution in the remediation costs. It is important to be aware that the subsidy must comply with the EU state aid rules.

## Capacity building and communication

Although there are now only 16 main hotspots identified, based on the experience in The Netherlands, Spain and other EU countries it is expected that the amount of sites to be remediate is actually much higher. The people which will be required to deal with these sites will have to increase accordingly, and they have to be trained. Research institutes and universities can play a main role in this, but also consultancies that have proven to have a lot of experience in the remediation of sites can take it as well.

Besides, to build capacity on quality assurance and quality control is essential. Certified people can ensure that the work will be done in a professional way.

For the implementation of the new soil law it is needed to inform the society, knowledge institutes (like research institutes and universities) and the industry and service providers, which play a main role in developing knowledge and transferring it. Training programmes are needed, not only on the technical side but also about risk communication.

On a national and international level a lot of knowledge networks exist, e.g.:

* CF: <http://www.commonforum.eu/> .
* NICOLE: <http://www.nicole.org/> .
* IMPEL: <http://www.impel.eu/>

Also financial support from EU is available to do research and knowledge transfer. Programmes like LIFE+, Interreg, Horizon 2020 stimulate cooperation between Member States and that experience can be shared. Pilot projects with neighbour (surrounding) countries are recommendable.

There is experience in the Netherlands with these kind of trainings programmes. The idea is to have a course for trainers.

A recent publication of the Joint Research Centre from the EC about success stories of remediation is available in the following link:

<http://www.sepa.gov.rs/download/zemljiste/RemediatedSites_Brownfields_success%20stories.pdf>

## Financial issues

Prevention measures are by far the cheapest to take. This is also beneficial for the industry, because remediation is much more costly (in general the costs are 100 times bigger than prevention measures).

Concerning contaminated land not only the industry might have a problem, also public organizations, like municipalities, own land and have to remediate especially when the pollutor has died or is not known yet. So there should be a budget/fund for the so called “orphan sites”. Here the governement can give the right example by remediating in a proper way.

Concerning the historical contaminated sites it is fair to contribute financially to the cost of the remediation. Especially in this case, Small and Medium Enterprises (SME) need financial support from the government, otherwise they will go bankrupt. E.g. The Netherlands have a special subsidy for the industry to contribute in the remediation costs (at a maximum of 70%). The costs for investigations are not part of the subsidy. The subsidy is part of the soil legislation and is written down in a special decree. An essential and stimulating point is that the industry must secure government funding at an early stage. Hereby the potential amount of contaminated sites will be known and a rough estimation of the costs can be made, necessary to get budget and political approval. See (in Dutch): handleiding bedrijvenregeling, 2013

<http://www.rwsleefomgeving.nl/onderwerpen/bodem-ondergrond/bodemsanering/bedrijfsterreinen/bedrijvenregeling/>.

## Stakeholders involvement

In the future it is preferable to put extra effort on the implementation of the Law on Soil. Concerning contaminated land it is clear that remediation costs a lot of money and for most industrial companies it is not their core business and therefore a close cooperation of all relevant stakeholders (all competent authorities and industries) is recommendable. E.g. The Netherlands have made a special covenant (= document about “Gentlement agreements” <http://rwsenvironment.eu/subjects/soil/policies-and/> ) on dealing with the legacy of contaminated land to give a stimulus to implement the new law. Recently also a separate covenant with the industry is signed for the period 2016-2020 (in Dutch: <http://www.rwsleefomgeving.nl/onderwerpen/bodem-ondergrond/bodemconvenant/convenanten/> ).

Special attention is required regarding the communication about the (potential) risks of the contaminated land. The perception of the society about contaminated land is hard to manage. The communication process with the neighbourhood of a polluted site about the risks should be professional and transparent. For suggestions see also sections 4.3. and 4.4.: about the possibility for the society to object the (draft) formal dicisions of the risk assessment and the remediation plan.

# Soil pollution prevention

***Soil pollution prevention saves money and protects the environment and public health.***

European Union has set clear measures for the activities falling under the scope of the IED to make sure that prevention is applied. Some Member States, like The Netherlands and Spain, have a similar approach also to potential soil polluting activities that are not under the IED.

The experience of the Member States is that they have suffered serious damages in the environment and in the human health because of the defficient soil pollution prevention. Apart from limiting certain uses of the soils in some cases that forces to change the projects for soil planning, as a consequence of the contamination many millions of euros have been spent in remediation.

Therefore it is considered as a **top priority to implement a soil pollution prevention strategy** as soon as possible in Macedonia. Existing laws could be used to start with, but the proposal is to include it in the draft Law on Soil Protection, making more emphasis on this subject in the draft law.

## Potentially soil polluting activities

The first task is to identify the activities that may have a potential to contaminate soils. In the case of the activities falling under the scope of the IED they have to prepare the soil baseline report or, if not, provide a clear justification of why it is not needed.

Regarding the rest of activities some examples of how is done can be found in the legislation of the Netherlands (Dutch guidelines on soil for industrial activities, the Activity Decree (Companies A,B and C, <http://rwsenvironment.eu/subjects/environmental/activities-decree/>) and the environmental legislation on soils in Spain and the Spanish Region of the Basque Country, see Annex 1 of <http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/suelos-contaminados/09047122800b7aff_tcm7-3206.pdf> .

## Soil baseline report

### IPPC (IED) sites

The article 22 (2) of the IED prescribes that operators which manipulate hazardous substances that can pollute soil or groundwater shall prepare and submit a baseline report to the competent authority. This baseline report shall contain information on the present use and, when available, on the past uses and existing information on soil and groundwater measurements or new ones related to the identified substances. Additionally in article 22(3), it is stated that after cessation of the activities, the operator shall compare the situation with the one in the baseline report and, if needed, take action to return the site to that state.

The Commission has published a communication on “Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions”[[3]](#footnote-4). The aim of is to clarify the wording and develop a material supporting the IED so Member States implement it in a consistent manner. It addresses the following elements:

1. Determining whether a baseline report is required to be produced.
2. Designing baseline investigations.
3. Designing a sampling strategy.
4. Developing the baseline report.

The tasks to execute the previous elements are divided into eight operative stages:

1. Identifying the hazardous substances that are currently used, produced or released at the installation.
2. Identifying the relevant hazardous substances.
3. Assessment of the site-specific pollution possibility.
4. Site history.
5. Environmental setting.
6. Site characterization.
7. Site investigation.
8. Production of the baseline report.

Practical indications are given to accomplish them. The baseline report shall be reviewed when there are significant changes in the activities.

On the other hand, article 16 (2) prescribes that periodical monitoring shall be carried out at least every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk contamination.

### Other sites (non IED)

Something similar can be done for the rest of activites, which are not covered by the IED and with potential to pollute soils or groundwaters. In the case of the Basque Country, these operators have to submit a baseline report in the application or communication before they start, and then a periodical report. When soil legislation was first approved a specific provision was introduced for existing activies in order to submit a preliminary report on the soil situation.

A guidance was prepared for the elaboration of this soil baseline report. The steps in the guidance[[4]](#footnote-5) are summarized in figure 3 below about the process to elaborate the baseline report:



Another guidance[[5]](#footnote-6) has also been developed to identify preventive mesures to avoid soil contamination, following the steps depicted in figure 4 below:



# Soil investigation, risk assessment and remediation

## Introduction

Due to the industrial activities in the past the Republic of Macedonia has a legacy on historical contaminated sites. The exact total number is not so important, but an estimation is important to get a political agreement and thereby financing for the historically contaminated sites. This estimate should be an important part of the National Soil Plan.

Fortunately, not every pollution poses risks for human or the environment. The **risks** are also **depending on the current (or near future) soil use**. For example, the exposure of contaminated soundbarriers (made from soil) or contamination in industrial areas is less harmful than in places where kids are playing. That means that the same contamination on spot A might give no risks and on spot B, because this is more vulnerable, the risks are unacceptable and that has to be remediated. Theoretically the problem can be solved by assigning to spot B a less vulnerable function, so that remediation is not needed.

## Soil investigation

As a useful example of how to collect a large amount of information on soil quality in an efficient way, in the Netherlands there are three triggers to investigate a site:

1. An environmental concern: the site is suspicious for posing risks to human or the environment from activities in the past or by an inspection of a plant. To prevent high costs of sampling and analyzing it is recommendable to have first a desk research based on information of the past: the so-called preliminary investigation. Former permits or other historical information can help to get a first impression of the situation. With the geohydrological information a conceptual model about source-path-receptor can be drawn and will be very helpful to understand the spatial variety in contents of the contamination. This is the basis for the main investigation. Based on results of this investigation the conceptual site model will be more defined.

To save costs of sampling and analyzing it is sometimes seductive to start remediation immediately, but a good picture of the contamination and spreading patrons into the groundwater is essential for the clean up and techniques to be used.

1. When a property will be sold: it is recommendable to ask for a soil status report.  
   With just a few samples of the soil information will be available about the quality of the soil in relation to the function of the land. The costs are relatively low (circa €1500) and protects the buyer for unforeseen cost. If the seller is also the polluter then it should be prescribed in legislation that there is a bank guarantee to remediate the site. Otherwise the contaminated land will never be remediated. It is very difficult and takes a lot of time in court to prove that the polluter could have known of the contamination. So it is better to seek for the cooperation and a pragmatic way to solve the problem. The Netherlands have already such a system of bank guarantees and this soil status report was also part of the proposal of an EU Soil Framework Directive.
2. When there will be something built on the site (e.g. for extending the company or changing the function of the land into housing). The moment of building activities is an opportunity to know if the soil quality is suitable for the function desired (e.g. housing or industry). Besides that always excavation of soil will take place and will be replaced on site or off site. To know the quality of the soil is essential to prevent that clean areas will be polluted or that it will be brought on agriculture land to elevate the land. E.g. in The Netherlands it is stated in the Housing Act that before building the quality of the soil should be investigated.

The perception and consequently the opposition of the society to live on contaminated land is enormous: “nobody wants to live on contaminated land!”. So this should be prevented. Before building is a “natural” moment to investigate.

## Risk assessment

Based on the information of the preliminary and main investigation a risk assessment in relation to the current (or near future) land use is needed. As mentioned earlier it is recommended that the responsibility should be allocated to the government to develop a risk toolbox. In The Netherlands the research institute RIVM has in cooperation with the competent authorities and the government developed a toolbox. The RIVM has also the task to keep it up to date and makes proposals to solve imperfections in practice. The toolbox is available in Dutch on the internet: <http://www.risicotoolboxbodem.nl/> . The toolbox is based on the CSOIL-model. Rebecca is a similar tool developed by the USEPA and could also be used.

In this risk assessment typically there is a distinction between unacceptable risks and other risks. Unacceptable risks are related to human health, ecology or dispersion of the contamination in the groundwater. If the workload of the Administration is too high a further prioritization by human risks is preferable. In The Netherlands also a time schedule is part of the legislation. If a site poses unacceptable risks the risk should be controlled or remediation should be started within 4 years. The time period starts from the moment the competent authority has taken a formal decision and has informed the owner of the site. For the sites that are less contaminated and so pose less risk, remediation is needed on a natural moment that fits the industry or other public organizations the best, e.g. in the case that a company wants to extend or if an area will be redeveloped. The ultimate policy goal is that all land use is suitable for the quality of the land.

## Soil remediation

If it is decided that based on the risk assessment remediation is needed a remediation plan has to be made and approved by the competent authority. The remediation plan should be announced in the newspapers and can be read at the town council (competent authority). It should be also part of the law that objection from the society can take place. So **transparency to the neighbourhood is essential about the risks**.

Part of the remediation plan should be different remediation strategies and options. **The three options mentioned in the Macedonian draft rulesbook seem to be too little for complicated sites**. The remediation goal is a balance between the costs of the remediation and the benefits for the environment. Depending on the situation it can be useful to divide the source and the plume. The source might be remediated by dig and dump, the plume might be managed and monitored.

Often a combination of techniques are used to remediate. Important is to ensure that during the remediation sufficient flexibility is available to deviate from the original plan. In the field it can happen that unforeseen developments are happening. It is clear that communication with all relevant stakeholders is needed.

Also when the remediation is finished it is important that a formal decision of the competent authority is made and announced again in the newspapers. Again it is possible for the neighbourhood to object again to this decision.

# Managing historically contaminated sites (hotspots)



## Background information on Macedonia

This chapter does not intend to be a comprehensive review of the present situation in Macedonia but just a brief summary of the situation, since there are other documents with the detailed information.

The basic approach that is being used to deal with the historically contaminated soils is the right one:

1. Inventory of the sites
2. Collection of information and monitoring
3. Prioritization based on risk assessment
4. Action Plan

Regarding the inventory, the MoEPP collected information on the most important hotspots and created an inventory that is the one used to comply with the obligations arising from the Stockholm Convention, Rotterdam Convintion and Basel Convention. Information on brownfields can be collected in the future cadastre of activities.

The Second National Environmental Action Plan (2005) and the National Waste Management Plan (2005) identified 16 industrial contaminated sites – hotspots. Based on the potential risk, these “hotspots” are ranked as follows:

High environmental risk:

1. OHIS A.D (organic chemical industry) at Skopje
2. MHK Zletovo (lead and zinc smelter) at Veles.

Medium environmental risk:

1. Lojane (former chromium, arsenic, antimony mine) at Kumanovo
2. Sasa (lead and zinc mine) at Makedonska Kamenica
3. Silmak ferro-silicon plant (former HEK Jugochrom) at Jegunovce
4. Toranica (lead and zinc mine) at Kriva Palanka
5. Makstil (iron & steel plant) at Skopje
6. Zletovo mine (lead and zinc mine) at Probistip
7. REK Bitola (Thermal power plant and lignite mine) at Bitola.
8. Bucim copper mine at Radovis (the mine was privatised and significant remediation works have been done through UNDP regional programme and by the owner. However, the environmental problems were not solved completely).

Low environmental risk:

1. Feni Industry (ferro-nickel smelter) at Kavadrci
2. MHK Zletovo (fertiliser factory) at Veles
3. REK Oslomej - ESM (Thermal power plant and coal mine) at Kicevo
4. Godel tannery at Skopje
5. OKTA Rafinerija AD (oil refinery) at Skopje
6. Tane Caleski (metal surface treatment) at Kicevo.

The prioritization of the hotspots was done in the framework of the EU Project - Preparation of National Waste Management Plan, Separate Study on hotspots, which was prepared in 2005 by the Dutch Company DNV. The Ministry of the Environment was responsible authority for the identification and prioritization process.

The first three cases have additional information:

1. In OHIS A.D (organic chemical industry) at Skopje
2. MHK Zletovo (lead and zinc smelter) at Veles.
3. Lojane (former chromium, arsenic, antimony mine) at Kumanovo.

In the case of OHIS and Lojane there have been preliminary studies (not a specific one in Lojane), risk screening and feasibility studies. As it has been understood, in the case of Zletovo, there have been some sort of preliminary studies.

## Identify the historical sites

Regarding the identification done in Macedonia, it is very positive the work done with the hotspots since it will allow to work initially with the hotspots that may have higher impact or risk for the public health or the ecosystems.

In the documents analysed there is information on the way waste has been managed in the Republic of Macedonia. According to it almost all landfills of the country can be considered as historically contaminated soils. Therefore they should at least be considerated candidates for the inventory of potentially contaminated soils.

This inventory of potentially polluted soils should be completed with the information coming from the cadastre of polluters of the recently updated Law on the Environment.

In order to have a first insight if a real soil contamination problem could be present in the sites within the cadastre, mainly in the facilities in operation, inspections can be very helpful.

There is new technology that can be very helpful to identify soil contamination problems like orthophoto interpretation.

As an example, in figure 5 below is shown the scheme of the guide that was prepared in the Basque Country for elaboration of action plans for abandoned landfills:



## Risk and impact assessment and prioritization

Considering the principles of soil protection the actions should be focused in controlling the risk in the most effective and efficient way taking into account the importance and urgency of the actions. According to the information a first risk assesment was done for the 16 hotspots and classified into high, medium and low risk. This risk or impact screening approach can be used for the rest of the historically contaminated sites.

As a result of the screening, classification on risk categories is helpful for the following steps. Nevertheless it is very important to have an initial estimation if there can be impacts or risk on human health that need inmediate action. In that case, urgent primary measures can be needed to control that risk. Some of them do not need to be complicated or expensive. Some examples can be to have some restriction on the access to the polluted sites, limiting exposure of receptors through measures like restricting use of polluted waters for certain uses, capping of the high polluted areas to control transport through air or leaching,…

The tools described in the previous chapter on soil investigation, risk assessment and remediation are very useful to evaluate the impact and perform the risk assessment. Preliminary and detailed investigation can be applied. In the case of landfills or waste dumping sites, the use of guidance on the waste characterization can be necessary. Some references about the methods can be found in the following links:

<http://rwsenvironment.eu/subjects/soil/publications/>

(in spanish) <http://www.ihobe.eus/Publicaciones/Ficha.aspx?IdMenu=750e07f4-11a4-40da-840c-0590b91bc032&Cod=909b3583-dbd7-4620-aaaf-989c0f5259e3&Idioma=en-GB&IdGrupo=PUB&IdAno=1998&IdTitulo=006>

## Action Plan

In the case of the Republic of Macedonia, some remedial actions have already been implemented in risky sites as emergency and temporary solutions. These are the cases of the Lojane mine where part of the dump was capped with clay soil or Silmak site, where a dumpsite with material contaminated with hexavalent chromium was capped and a surface water monitoring was set around the place.

The action plan requires a previous evaluation of all available information on the different sites within the action plan. It can be for the whole inventory of the historically contaminates soils or a subgroup of them, e.g. non operating landfills.

A risk based approach should be used to prioritise the intervention in the different hotspots. In this approach, several criteria can be used like affection to human, ecosysytems, socioeconomic conditions, soil use, … Human health risk should be considered a top priority and whenever is not acceptable, immediate actions should be taken to control the risk.

As indicated previously in this report, the **soil remediation** is not conceived as a tool to return soil always to background conditions but **to reach a balance**, looking for the best solution to control the risk to human health and ecosystems on the one hand while allowing the intended use for that soil on the other.

Therefore almost every action plan has to be **tailored made** to the particular site and the intended use. Having said that there are a number of **measures that are quite common to hotspots** **associated to** the presence of **waste**. Some of then are surface sealing, water-proof layers, surface drainage, leachate collection and evacuation, groundwater drainage, water pumping systems, waste collection and management, on-site estabilization of waste,….

The action plan should consider the time and resources needed and before implementing it must be ensured that they are available.

## Soils contaminated with lindane and its isomers

The Macedonian environmental administration is clearly concerned about the risk associated to the OHIS hotspot. This case is associated to the contamination from lindane and its isomers, but not only (CHC, TCB, DDD, DDE an DDT also were found at least is some hotspots). Heavy metals, mainly mercury, are also involved.

Several studies have been conducted in this hotspot on prelimitary reports, soil investigation, risk assessment and feasibility studies.

The present situation is that the facility remains abandoned, with 2 dumps of HCH isomers. There is not information about any modification of them.

The studies by Enacon and D´appolonia indicate that there is a contamination of soil, groundwater and afection to some of the crops in the surrounding area.

The MoEPP has prepared Terms of Reference for the provision of services to perform “on the Site investigation related to Removal of Technical and Economic Barriers to Initiating the Clean-up Activities for Alpha-HCH, Beta-HCH and Lindane Contaminated Sites at OHIS”.



Figure 6. Public-private cooperation for different contaminated sites

It must be emphasized that the location of the hotspots has a big influence on the possibilities of development and so for remediation (see figure 6 above). In a simple way, three categories could be distinguished. Public driven projects (C) are locations where hardly any dynamic can be expected. For example, it will be the one including sites which are located in places in the middle of nowhere with low nature value and almost no demand for development. The B category corresponds to sites where the possibilities of development or other values of soil are uncertain and might be difficult by the market only. Public-private cooperation is needed to develop those areas. The best category (A) corresponds to sites where possibilities of development or other values are high. Involvement of public investments is not needed. In this project, we do not have all the information, but looking at the location almost integrated in the city of Skopje, taking into account the development of the city, it seems that OHIS site could be financed by private parties.

Due to the limited task and limited time it is not possible to analyse all the existing documentation. Therefore the analyses are on headlines and even sometimes incomplete. **Nevertheless the following comments can be made and** can also be **useful for the terms of reference** mentioned above.

* In the soil prevention policy top priority should be given **to protect** the **public health**. Contamination that could affect nearby population has been detected. This means that urgent measures are needed to evaluate and to set some measures. This is the case of aspect like the access to the area, the use of the groundwater, the dust emissions from the site,…
* The definition of primary measures to control the exposure of population is the most important and inmediate action. To achieve this goal there are quite straightforward measures like restricted access, capping, restricting the use of groundwater,… that could be considered based on data.
* Starting point for the remediation policy is a risk-based approach, e.g. a functional remediation. To choose the remediation option it is needed to know the intended use of the site. We have no information on the spatial planning and thereby development of the area. Sometimes this information can simplify a lot the choice of remediation approach, since as discussed before the policy is that one does not need to recover to the background level always, but to the values that allow the intended use with the appropriate measures. This gives more flexibility, lower costs and the results can be obtained with more efficacy and efficiency, without compromising risks for public health or ecosystems.
* Regarding terms of reference, there are aspects like the future use, the conceptual site model, the preferable options to remediate, the primary measures as could be capping, … that have significant influence in the sampling. Surely they have been taken into account when preparing the terms of reference but there is not information about it in them.
* In the provided documents, different remedial options have been considered. Considering previous experiences in the Basque Country and The Netherlands, it seems that remediation of the source by containment or dig and dump is a sound alternative. However it is not well explained in the documents why it is not considered.
* The groundwater contamination plume can be managed or remediated taking into account the geohydrological situation. It is not clear what are the ideas for it.
* The execution of the terms of reference could be used for knowledge transfer and capacity building of MoEPP staff related to soil remediation and should be considered in them.
* The terms of reference regarding soils, waste, groundwater and air sampling state that the sampling should be planned according to specific international accepted methods. It does not specify if they should be ISO or CEN proof or even if USEPA based,…

**Experience of HCH hotspot in the Basque Country**

More detailed information on the HCH problem in the Basque Country can be found in the following link:

<http://www.ihobe.eus/Paginas/Ficha.aspx?IdMenu=d28538fb-e715-42d0-a57e-33988c568ca5&Idioma=en-GB>

In the case of the Basque Country there were two industrial plants near to the city of Bilbao which were producing lindane from 1947 to 1987. The estimated amount of generated waste was around 82000 t and the amount of pure waste was 5000 t. Around 77000 t were distributed in around 36 sites and mixed with other waste or soil. The surface of polluted soil was about 410 Ha and 450000 m3.

After analyzing the different alternatives, the solution adopted in this case was to build a plant to treat the pure waste, and dispose the polluted soils in secure landfills. The project lasted 10 years (from 1992 to 2002) and the estimated cost was around 52 million euros in total.

The process of the HCH treatment plant was the catalytic dechlorination into TCB



Figure 7 below shows the final balance of HCH treatment plant that finished working on the 29th october 2001:



Some of the summary data of the HCH treatment plant are:

* Cost: 12 million euro. Funding 80% EU and 20% Basque Government
* Amount treated: 3211 t of pure HCH
* Functioning period: 1999-2001
* Treament cost: 3.7 euro/kg

The disposal of the HCH polluted soils were done in two secure landfills:

* Loiu (close to an airport)
  + Cost: 8.5 million euro (50% paid by the Spanish AENA (state-owned company managing general interest airports and heliports in Spain))
  + Disposed volume: 113,718 m3
  + Construction period: 1996-1998
  + Number of remediated sites: 4
* Argalario
  + Cost: 34 million euro. It includes the conditioning and sealing of an existing landfill and then the safety cell and leachate treatment plant. Funding: 80% EU and 20% Basque Government.
  + Disposed volume: 340,000
  + Construction period: 1999-2002
  + Number of remediated sites: 23

Copies of videos on the HCH treatment plant and secure landfills explaining the projects have been provided to the MoEPP.

After reviewing the projects, some of their strategic strengths are considered to be the following:

* Public participation and transparency. There has been a comission to follow the project, difussion of the project, information to the neighbours, publication of information on the projects and their results,…
* Reuse of the remediated soils.
* Development of specific legislation on waste and soil protection.
* Technical competence in the development of the projects: sealings, monitoring, safety, …
* Treatment of the HCH pure waste and commercialization of the generated product TCB.
* Control and monitoring of all the movements of the HCH polluted materials.

There are also considerations on the opportunities for improvement, e.g. the cost-benefit analysis of the HCH treatment plant was too optimistic, since it was just to treat about 4000 t in 2 years and the commercialization of the generated product had some difficulties.

The final foreseen use of the remediated sites is another point that has a strong influence in the choice of remediation alternative.

# Closing remarks

A good soil prevention policy is cost effective and beneficial to both the environment and the industry. The current EU-legislation is mainly focussed on the prevention. Regardless the legacy from the past further contamination should be prevented. Therefore a good inspection of the preventing measures is essential.

The documents provided by Macedonian beneficiaries are a good basis for a soil policy. Especially the Rulebook on the procedures and criteria for the identification and management of contaminated sites is well developed. A missing link seems to be the conceptual site model (see Annex 2 for a pictogram) and the reference to a risk assessment model developed by research institutes commissioned by the government.

Especially attention for a transparent communication on the risks and remediation plan for the 16 hot spots is needed. It is preferable to use these sites as pilots so that also capacity building for knowledge transfer can be done.

Depending on the position of the contaminated site a connection with the spatial planning is useful. For example, it is smart to plan an underground garage on a site where the contamination is (make work with work!). Private parties (like developers) might have an interest in developing an area and thereby will contribute to the costs of the remediation (A- locations, as explained in section 5.5).

A long term remediation program (5 to 10 years) is needed. Political commitment and thereby budget for a long period is essential also in relation to spatial planning and (re)development.

The duration of the mission to develop this document was short (4 days). Therefore reaction on headlines was often the case. Having said that, the main conclusion is that the Republic of Macedonian is taking the right approach to deal with the soil protection but immediate action is required in some areas:

* Building capacity. In the MoEPP and SEI there should be soil units that have full technical competence. Capacity can be increased by developing a system with accredited bodies to perform soil investigations and risk assessments and remedial studies.
* Remediation plan for historical polluted sites. A realistic plan should be prepared considering as first issue the control of high risk scenarios and measures that could help to reduce in an important amount the final remediation.
* Soil prevention policy. Existing environmental legislation could already be enough to encourage prevention in potentially soil polluting activities taking advantage of the inspections that are being done in them. In addition a prevention policy should be developed specifically in the legislation.
* Funding. The MoEPP should work to make sure that there is a long term political commitment to include in the budget money to keep technical units in the administration whose main task is soil protection and to ensure priority remediation actions are taken.
* Legislation. Development of the soil protection policy and legislation.
* Stakeholder’s involvement. Transparency and giving the opportunity to public participation from the beginning is a key issue.

# Annex 1 Additional literature

1. The Dutch Soil Protection Act: <http://rwsenvironment.eu/subjects/soil/legislation-and/>
2. Spain. Information on soil protection

<http://www.magrama.gob.es/en/calidad-y-evaluacion-ambiental/temas/suelos-contaminados/>

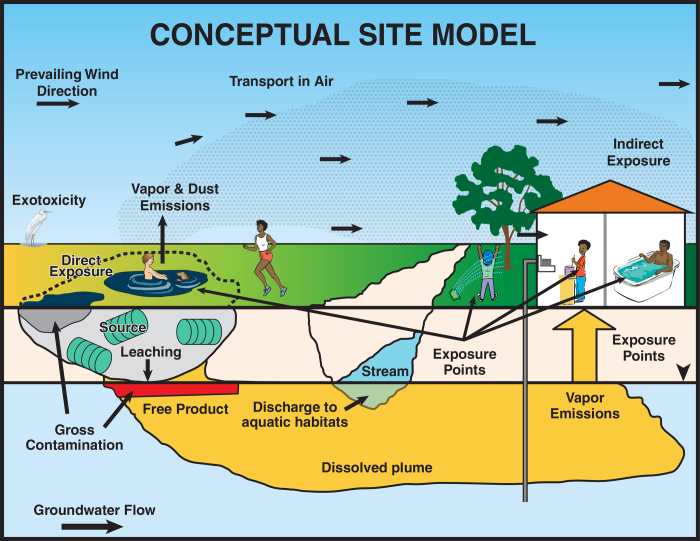
1. Basque Country. Links to administrative sites with information on soil protection

<http://www.ingurumena.ejgv.euskadi.eus/r49-suelo/es/>

<http://www.ihobe.eus/Paginas/Ficha.aspx?IdMenu=8eefd843-1f7a-43dc-bc9a-ca08859ccaf6&Idioma=en-GB>

# Annex 2 – Conceptual site model pictogram

A conceptual-site-model is an important instrument in understanding the risks of contaminated land:



1. “Sum PCBs” are the sum of PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153 and PCB 180 [↑](#footnote-ref-2)
2. “Sum PACs” are the sum of naftaleen, fenantreen, antraceen, fluorantheen, chryseen, benzo(a)antraceen, benzo(a)pyreen, benzo(k)fluorantheen, indeno(1,2,3cd)pyreen and benzo(ghi)peryleen [↑](#footnote-ref-3)
3. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0506%2801%29 [↑](#footnote-ref-4)
4. IHOBE (2007) Procedimiento para la elaboración del informe preliminar de la situación del suelo [↑](#footnote-ref-5)
5. IHOBE (2008) Guía Técnica de identificación de medidas preventivas contra la contaminación del suelo [↑](#footnote-ref-6)